

Please ADD the following new claims:

29. (New) The method according to claim 8, wherein a shadow of the conductive bump is utilized to determine the cutting position.

B4

30. (New) The method according to claim 8, wherein a shadow of a metal mark on the wafer is utilized to determine the cutting position.

REMARKS

In accordance with the foregoing, the specification and claims 6, 8 and 9 have been amended. Claims 5 and 7 have been canceled without prejudice or disclaimer, and claims 29 and 30 have been added.

Applicant notes with appreciation the Examiner's indication that claims 10 and 14 contain allowable subject matter, and would be allowed if placed in independent form. However, it is respectfully submitted that all of the pending claims are allowable for at least the reasons stated below.

REJECTIONS UNDER 35 USC 102

Claims 1, 5, 7 and 11

Claims 1, 5, 7 and 11 were rejected under 35 U.S.C. 102(b) as being anticipated by Trevail et al. U.S. Patent 3,924,323. This rejection is respectfully traversed for at least the following reasons. Claims 5 and 7 will not be addressed since they have been canceled without prejudice or disclaimer.

It is respectfully submitted that in Travail et al., a wafer 2 is placed on a temporary substrate 16 with a wax layer 18 interposed therebetween. The wax layer 18 is simply dissolved to separate the wafer 2 from the temporary substrate 16. See column 2, lines 43-45. When the temporary substrate 16 has been separated from the wafer 2, no wax layer 18 remains on the wafer. Accordingly, at no point does Travail et al. teach or suggest an operation of "transferring," any material, as recited in independent claim 1 of the instant invention. Furthermore, Travail et al. does not teach or suggest, among other things, the use of an underfill material sheet. It is respectfully submitted that the term "underfill material" or "underfill

"layer" is a technical term in the field of the present invention, which is commonly known to those having an ordinary skill in the art, which is not provided in the teachings by Travail et al. For example, in the technical field such as the one in which the present invention is directed, an underfill material should remain between a semiconductor chip and a printed circuit board after the semiconductor chip has been mounted on the printed circuit board. In contrast, the wax layer 18 is not an underfill material or layer, but is a temporary material that is intended to be dissolved away.

In view of the above points, it is respectfully submitted that Travail et al. does not teach or suggest, among other things, "transferring an underfill material sheet adhered to a surface of a thin film member onto the upward front side of the wafer," as recited in independent claim 1 of the present invention. Further, Travail et al. does not teach or suggest, among other things, adhering an underfill material sheet onto the upward front side of the wafer," as recited in independent claim 11 of the present invention. Accordingly, it is respectfully submitted that independent claims 1 and 11 are allowable over Travail et al. In order for a document to anticipate a claim, the document must teach every element of the claim. See MPEP 2131. Further, in the event that the Office Action is relying on the theory of inherency in any manner, "the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). See also MPEP 2112. Accordingly, since Travail et al. does not teach or suggest each of the features recited in claims 1 or 11, it is respectfully submitted that this document cannot be properly used to reject these claims, or any claims which depend therefrom.

For at least the above reasons, it is respectfully submitted that independent claims 1 and 11, and claim two, which depends from claim 1, are allowable over Travail et al.

Claims 1 and 7

Claims 1 and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Higashi et al U.S. Patent 5,918,113. This rejection is respectfully traversed for at least the following reasons. Claim 7 will not be addressed since it has been canceled without prejudice or disclaimer.

At page 3 of the Office action, the Examiner broadly alleges that Higashi et al. discloses a method of supplying an underfill material 20 for a semiconductor chip, comprising..."transferring an underfill material sheet 20 adhered to a surface of a thin film

member 26 onto the upward front side of the wafer 50."

It is respectfully submitted that contrary to the assertions made by the Examiner, Higashi et al. disclose an anisotropic conductive adhesive film 20 held on a release paper or film 26. As is illustrated in Fig. 10, as relied upon by the Examiner, and column 6, lines 23-43, the adhesive film 20 is only transferred to a "substrate" 60 from the release paper 26, not transferred onto an upward front side of a wafer, as recited in independent claim 1 of the present invention. Further, Higashi et al. is limited to the use of an adhesive film 20 pressed toward the substrate 60, and does not teach or suggest the use of an underfill material. Accordingly, it is respectfully submitted that Higashi et al. does not teach or suggest, among other things, "transferring an underfill material sheet adhered to a surface or a thin film member onto the upward front side of the wafer," as recited in independent claim 1 of the instant invention. Accordingly, it is respectfully submitted that independent claim 1 is not anticipated by Higashi et al., and withdrawal of this rejection and allowance of this claim are earnestly solicited. See above regarding anticipation requirement.

Claims 1 and 2

Claims 1 and 2 are rejected under 35 U.S.C. 102(e) as being anticipated by Machida et al. U.S. Patent 5,972,780. This rejection is respectfully traversed for at least the following reasons.

At page 3, item 4 of the Office action, the Examiner broadly alleges that Machida et al. discloses "a method of supplying an underfill material for a semiconductor chip, comprising...transferring an underfill material sheet 20 adhered to a surface of a thin film 10 onto an upward front side of the wafer 103."

Contrary to the assertions by the Examiner, it is respectfully submitted that Machida et al. disclose a "dielectric film 20" held on a sheet film 10. In Figs. 3B-3D, as relied upon by the Examiner, the dielectric film 20 is transferred to a semiconductor substrate 9 from the sheet film 10. Machida et al. does not disclose the use of an underfill material, as recited in independent claim 1 of the present invention. Further, Machida et al. does not teach or suggest the use of conductive bumps on a wafer. More specifically, the Al interconnections 21 are not used to connect a chip and a printed circuit board, and do not act as (conducting bumps). Accordingly, it is respectfully submitted that Machida et al. does not teach or suggest, among other things, "transferring an underfill material sheet adhered to a surface or a thin film member onto the upward front side of the wafer," as recited in independent claim 1 of the present invention.

Hence, it is respectfully submitted that independent claim 1, and claim 2, which depends therefrom, are not anticipated by Machida et al., and withdrawal of this rejection and allowance of these claims are earnestly solicited. See above for requirement for anticipation.

Claims 7 and 11

Claims 7 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Ohuchi U.S. Patent 6,107,164. This rejection is respectfully traversed for at least the following reasons. Claim 7 will not be addressed since it has been canceled without prejudice or disclaimer.

At page 4, item 5 of the Office action, the Examiner broadly alleges that Ohuchi discloses "a method of making a semiconductor chip, comprising; adhering an underfill material sheet 23 onto the upward front side of the wafer."

Contrary to the assertions made by the Examiner, it is respectfully submitted that Ohuchi does not teach or suggest the use of an underfill material or layer, but instead uses a resin 23 to seal the surface of a wafer 10. Furthermore, the electrodes 5 of Ohuchi are formed after the resin 23 has been coated in a wafer 10. See column 3, lines 29-45. Accordingly, it is respectfully submitted that Ohuchi does not teach or suggest, among other things, "method of making a semiconductor chip, comprising: locating a wafer receiving a conductive bump on an upward front side; adhering an underfill material sheet onto the upward front side of the wafer," as recited in independent claim 11 of the present invention. Hence, Ohuchi does not anticipate claim 11. See above regarding anticipation requirement.

For at least the above reasons, it is respectfully submitted that independent claim 11 is allowable over Ohuchi, and withdrawal of this rejection and allowance of this claim are earnestly solicited.

Claims 7, 8, 11 and 12

Claims 7, 8, 11 and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Glenn et al. U.S. Patent 6,309,943 B1. This rejection is respectfully traversed for at least the following reasons. Claim 7 will not be addressed since it has been canceled without prejudice or disclaimer.

Regarding the rejection of independent claim 8, as amended, it is respectfully submitted that although Glenn et al. makes a mark on a wafer to cut the same, this patent is limited to using a laser 454 to form an alignment mark 462 on the back of the wafer 310 (see Figs. 4 and 5A-5C and column 6, lines 26-36), not to provide a shadow as does an X-ray, as recited in

independent claim 8. Accordingly, it is respectfully submitted that Glenn et al does not teach or suggest “irradiating an X-ray on the wafer; determining a cutting position on the wafer based on the X-ray penetrating through the wafer; and dicing the wafer from a backside of the wafer based on the cutting position,” as recited in independent claim 8 of the present invention, as amended.

Regarding the rejection of independent claim 11, the Examiner broadly alleges that Glenn et al. disclose “adhering an underfill material sheet 632 onto the upward front side of the wafer 310.” Contrary to the assertions by the Examiner, it is respectfully submitted that Glenn et al. does not teach or suggest, among other things, the use of an underfill material sheet. As stated above, the term “underfill material” or “underfill layer” is the technical term in the field of the present invention, which is commonly known to those having an ordinary skill in the art, which is not provided in the teachings by Glenn et al. In contrast to the use of an underfill material, Glenn et al is limited to the use of attaching a tape 632 to the wafer 310 to protect the front of the wafer during sawing. Accordingly, it is respectfully submitted that Glenn et al does not teach or suggest, among other things, “adhering an underfill material sheet onto the upward side of the wafer,” as recited in independent claim 11 of the present invention.

In view of the above points, it is respectfully submitted that independent claims 8 and 11, and claims 9-10 and 12, which depend from claims 8 and 11, respectively, are allowable over Glenn et al., and withdrawal of this rejection and allowance of these claims are earnestly solicited.

REJECTIONS UNDER 35 USC 103

Claims 6, 9 and 13

Claims 6, 9 and 13 were rejected under 35 U.S.C. 103(a) as being unpatentable over Trevail et al. U.S. Patent 3,924,323. This rejection is respectfully traversed for at least the following reasons.

The Examiner alleges at page 5, item 9 of the Office action, that although Trevail et al. lacks forming the resin lamination on the backside of the wafer by transferring it from a thin film member or forming the resin lamination by an evaporation method, “selecting an optimum resin lamination formation method, e.g. transferring from a thin film member or evaporation, to form the resin lamination in the primary reference of Trevail et al. is only considered to be routine optimization of the method disclosed by Trevail et al. since Trevail et al is already forming a resin lamination.”

PAC

It is respectfully submitted that Trevail et al. is directed to the use of a resin 24 that can be spread over the wafer 2 such that the grooves 20 are filled with this resin (see column 2, lines 35-39). Accordingly, only a resin in a liquid state can fill out the grooves 20 of Trevail et al., and the epoxy resin 24 of Travail et al. cannot be in the form of a sheet. Thus, Travail et al. actually teaches away from the present invention as recited in independent claim 6, as amended, since Travail et al. requires the use of a liquid form of resin to fill the holes 20 of the wafer. Accordingly, it is respectfully submitted that Travail et al. does not teach or suggest, among other things, "transferring a resin sheet, adhered to a surface of a thin film member, to a backside of the wafer, so as to form a resin lamination on the backside of the wafer," as recited in independent claim 6 of the present invention, as amended. Furthermore, since Travail et al. is directed to specifically using a resin that can be spread over the wafer such that the grooves 20 of the wafer are filled with the resin, one of ordinary skill in the art would not have been motivated to replace the spreadable resin of Travail et al. with the method of transferring of a resin sheet from a thin film member to the backside of a wafer, as recited in independent claim 6 of the present invention. Accordingly, it is respectfully submitted that since Travail et al. does not teach or suggest each of the features recited in independent claim 6, this claim is allowable over Travail et al., and withdrawal of this rejection and allowance of claim 6 are earnestly solicited.

Regarding the rejection of claims 9 and 13, it is respectfully submitted that each of these claims are allowable for at least the reason that they depend from independent claim 11, which is allowable over Travail et al., as pointed out above regarding the rejection of independent claim 11. Accordingly, withdrawal of the rejection of these claims and allowance thereof are earnestly solicited.

Claims 7, 8, 11 as 12

Claims 7, 8, 11 as 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orcutt U.S. Patent 5,904,548. This rejection is respectfully traversed for at least the following reasons. Claim 7 will not be addressed since it has been canceled without prejudice or disclaimer.

Regarding the rejection of claim 8, it is respectfully submitted that although Orcutt provides where an infrared light is utilized to align grooves 28, this infrared light is not dependable for providing the advantage of penetrating through a wafer along with an underfill material made of resin, as can an irradiating X-ray, as provided in independent claim 8 of the present invention, as amended. Accordingly, it is respectfully submitted that Orcutt does not

teach or suggest, among other things, "reversing a wafer receiving a conductive bump on an upward front side; irradiating an X-ray on the wafer; determining a cutting position on the wafer based on the X-ray penetrating through the wafer; and dicing the wafer from a backside of the wafer based on the cutting position," as recited in independent claim 8 of the present invention, as amended. Accordingly, it is respectfully submitted that since Orcutt does not teach or suggest each of the features of independent claim 8, as amended, this claim is allowable over Orcutt.

Regarding the rejection of independent claim 11, it is respectfully submitted that Orcutt is directed to the use of a saw tape 29, wherein a wafer 21 is removed from the saw tape 29 (see column 2, lines 60-65). This saw tape 29 is not the same as the underfill material as recited in independent claim 11, which remains between the semiconductor chip and a printed circuit board after the semiconductor chip has been mounted on the printed circuit board. Moreover, the underfill material of independent claim 11 is applied to the upward front side of the wafer (over a conductive bump). Thus, the underfill material is not applied to a flat surface. In contrast to independent claim 11, the saw tape 29 of Orcutt is intended to be of an adhesive material similar to the handling film, as disclosed at column 2, lines 47-48. Accordingly, the saw tape 29, the handling film, etc. should support the wafer 1 by itself, and therefore cannot accept the embedment of a conductive bump. Stated differently, the saw tape 29 is intended to be applied only to a flat surface of a wafer.

In view of the above points, it is respectfully submitted that Orcutt does not teach or suggest, among other things, "locating a wafer receiving a conductive bump on an upward front side of the wafer; adhering an underfill material sheet onto the upward front side of the wafer; reversing the wafer; and dicing the wafer from a backside of the wafer," as recited in independent claim 11 of the present invention. Accordingly, since Orcutt does not teach or suggest all of the features of independent claim 11, this claim, and claim 12 which depends therefrom, are allowable over Orcutt, and withdrawal of this rejection and allowance of these claims are earnestly solicited.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

09/753,570

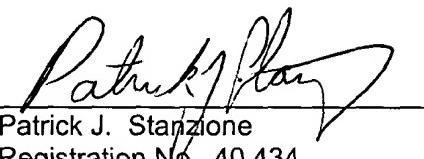
If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: February 3, 2003

By:


Patrick J. Stanzione
Registration No. 40,434

700 Eleventh Street, NW, Suite 500
Washington, D.C. 20001
(202) 434-1500

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Please REPLACE the paragraph beginning at page 27, line 28, with the following paragraph:

An electromagnetic wave is then irradiated on the silicon wafer 23. An infrared source 74 may be employed to irradiate the electromagnetic wave. An infrared ray irradiated from the infrared source 74 sequentially passes or penetrates through the silicon wafer 23, the underfill material sheet 67 and the thin film member 66. An infrared camera 75 is designed to capture the penetrating infrared ray below the second platen 72. [the] The infrared camera 75 detects the shadow of the input/output bumps 59 which blocks out transmission of the infrared ray. The shadow of the input/output bumps 59 is utilized to determine the cutting position on the silicon wafer 23. In this case, the infrared source 74 and the infrared camera 75 may be moved or shifted along a horizontal direction in unison.

IN THE CLAIMS:

Please CANCEL claims 5 and 7 without prejudice or disclaimer.

Please AMEND the following claims:

6. (Amended) A [the] method of making a semiconductor chip, [according to claim 5, further] comprising:

forming a conductive bump on an upward front side of a wafer;

reversing the wafer; and

transferring a resin sheet, adhered to a surface of a thin film member, to a [the] backside of the wafer, so as to form a [in forming the] resin lamination on the backside of the wafer.

8. (Amended) A [the] method of making a semiconductor chip, [according to claim 7, further] comprising:

reversing a wafer receiving a conductive bump on an upward front side;

irradiating an X-ray [an electromagnetic wave] on the wafer; [and]

determining a cutting position on the wafer based on the X-ray [electromagnetic wave] penetrating through the wafer; and

dicing the wafer from a backside of the wafer based on the cutting position.

9. (Amended) The method of making according to claim 8 [7], further comprising:
forming a nick along a contour of the semiconductor chip on the backside of the wafer;
and
forming an evaporated resin lamination on the backside of the wafer.

Please ADD the following new claims:

29. (New) The method according to claim 8, wherein a shadow of the conductive bump is utilized to determine the cutting position.

30. (New) The method according to claim 8, wherein a shadow of a metal mark on the wafer is utilized to determine the cutting position.